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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/902,429	07/10/2001	Qi Xiang	F0588	7718

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EXAMINER

SCHILLINGER, LAURA M

ART UNIT	PAPER NUMBER
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2813

DATE MAILED: 03/19/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/902,429

Applicant(s)

XIANG ET AL.

Examiner

Laura M Schillinger

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on 10 July 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☐ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) 15-21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- 1) ☐ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

Art Unit: 2813

## DETAILED ACTION

### *Claim Objections*

Claim 3 is objected to because of the following informalities: "fist" needs to be changed to "first". Appropriate correction is required.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 1-4, and 8-11 are rejected under 35 U.S.C. 102(e) as being anticipated by Kumar et al ('626).

In reference to claim 1, Kumar teaches a device comprising:

a) a central channel region comprising a first semiconductor lightly doped with a first impurity to increase first conductivity free carriers (Fig.2C (210));

b) a source region and a drain region on opposing sides of the central channel region, both source and the drain regions being the first semiconductor heavily doped with the first impurity element (Fig.2B (source and drain) See also Col.9, lines: 5-10);

Art Unit: 2813

c) a gate adjacent the channel region and forming a junction with the channel region, the gate comprising the first semiconductor and a second semiconductor with an energy gap greater than the first semiconductor and being doped with a second impurity element to increase carriers of the opposite conductivity as the first free carriers (Fig.2B (21) and Col.5, lines: 10-15).

In reference to claim 2, Kumar teaches further including a backgate adjacent the channel region and on an opposing side of the channel region from the gate, and forming a junction with the channel region, the backgate comprising the first semiconductor and a second semiconductor with an energy gap greater than the first semiconductor and being doped with a second impurity element to increase carrier of the opposite conductivity as the first free carriers (Fig.2B(21) and Col.4, lines: 45-65).

In reference to claim 3, Kumar teaches wherein the first semiconductor is silicon (Col.4, line: 60).

In reference to claim 4, Kumar teaches wherein the first conductivity free carriers are electrons and the second semiconductor is carbon and the first and second form a silicon carbide crystal structure (Col.4, lines: 60-65).

In reference to claim 8, Kumar teaches a device comprising:

Art Unit: 2813

a) an insulating oxide layer separating a device layer of semiconductor material from a bulk semiconductor base region (Col.5, lines: 25-30);

b) a generally rectangular central channel region within the device layer semiconductor material doped with a first impurity element to increase first conductivity free carriers (Fig.2C (210));

c) a source region and a drain region on opposing sides of the generally rectangular central channel region, both the source and drain comprising the device layer semiconductor material heavily doped with the first impurity element (Fig.2B (source and drain) See also Col.9, lines: 5-10);;

d) a gate adjacent the channel region and extending along a side of the central channel region adjacent the source and forming a junction with the channel region, the gate comprising the device layer semiconductor and a second semiconductor with an energy gap greater than the device layer semiconductor and being doped with a second impurity element to increase carrier so the opposite conductivity as the first free carriers (Fig.2B (21) and Col.5, lines: 10-15).

In reference to claim 9, Kumar teaches further including a backgate adjacent the channel region and on an opposing side of the channel region form the gate, and forming a junction with the channel region, the backgate comprising the first semiconductor and a second semiconductor with an energy gap greater than the first semiconductor and being doped with a second impurity element to increase carrier of the opposite conductivity as the first free carriers (Fig.2A (21) and Col.4, lines: 45-65).

Art Unit: 2813

In reference to claim 10, Kumar teaches wherein the first semiconductor is silicon(Col.4, line: 60).

In reference to claim 11, Kumar teaches wherein the first conductivity free carriers are electrons and the second semiconductor is carbon and the first and second form a silicon carbide crystal structure (Col.4, lines: 60-65).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5 and 12; 6 and 13; and 7 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumar et al ('626) as applied to claims above, and further in view of Yamazaki et al ('887).

In reference to claims 5 and 12, Kumar fails to explicitly teach wherein the first conductivity free carriers are electrons and the second conductivity free carriers are holes. However, Yamazaki teaches doping with Arsenic to form an N-type region (carriers are electrons) [Yamazaki -Col.4, lines: 10-16] for an NTFT and a channel doping with Boron which is a P-type region (carriers are holes) [Yamazaki- Col.4, lines: 15-25]. It would have been obvious to one of ordinary skill

Art Unit: 2813

in the art to modify Kumar's teachings to include Yamazaki's doping steps because Kumar teaches to dope the source and drain regions (Col.9, lines: 5-10) and Yamazaki teaches doping to correspond to a NTFT, and the type of dopants provided are a matter of choice to formulate either a NTFT or PTFT. Furthermore, the method of doping to form the channel, source and drain and very well-known in the art.

### *Conclusion*


The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Forbes ('623) teaches a similar structure including a back gate.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Laura M Schillinger whose telephone number is (703) 308-6425. The examiner can normally be reached on M-F 7:00 -4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1500.

LMS  
March 7, 2002

  
OLIK CHAUDHURI  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800